

Placement and Dimensions of MACS-5700 Incident Beam-Line Elements

Element		Total Thickness	Local Thickness	x	y	2y	2Y
					Radius	Diameter	Clearance Diameter
Theoretical Beam Convergence Point				-1200	0		
Cold Source Face				0	37.7	75	84
Beam Hole				1654	89.7	179	199
Face of Bio Shield @ Beam C/L				2435	114.2	228	254
Forward Edge of Bio Shield				2600	119.4	239	265
Shutter In				2620	120.0	240	267
Shutter Out				3320	142.0	284	316
Cryo Filter Exchanger			CFX	3330	142.4	285	316
			150	3518	148.3	296.5	330
			100	3625	151.6	303.3	337
		440	80	3712	154.4	308.7	343
			20	3732	155.0	310.0	344
				3770	156.2	312	347
In-line Collimator Exchanger			ICX	3800	157.1	314	349
			140	3940	161.5	323	359
		355		3945	161.7	323	359
			210	4155	168.3	337	374
Variable Beam Aperture			VBA	4165	168.6	337	375
			100	4265	171.7	343	382
		205		4270	171.9	344	382
			100	4370	175.0	350	389
		310		4375	175.2	350	389
			100	4475	178.3	357	396
Monochromator		Leading edge	DFM	4465	178.0	356	396
35°		Axis		4700	185.4	371	412
Total Travel		90°		5700	216.8	434	482
1587		106°		5900	223.1	446	496
		130°		6287	235.3	471	523
Beam Dump Window				7000	257.7	515	573
Beam Dump				9691	342.3	685	761

Table 1. Key dimensions for the MACS-5700 layout that was the subject to the July 2003 NCNR review. Location of neutron active components in the MACS incident beam line and the approximate transverse dimensions of the incident beam at those locations.

Column keys:

Element: This column identifies the functional element.

Total Thickness: For selected elements this column provides the overall thickness of the device along the beam path.

Local thickness: For selected elements, this column provides the neutron active length of the device.

x: is the location of the device along the MACS beam line relative to a center point which is the front face of the cold source.

y: is the radius of the incident beam cone at the specified location.

2y: is the diameter of the incident beam cone at the specified location.

2Y: is a clearance diameter beyond the incident beam.

Row Keys:

Theoretical beam convergence point: The MACS incident beam envelope is in the form of a conical section. The tip of the cone lies behind the face of the cold neutron source at the so called theoretical beam convergence point.

Cold Source Face: Moving along the central beam line of CTW towards the cold source, the first surface that provides liquid hydrogen containment is denoted the Cold Source Face. This is the curved inner surface of the cold source.

Beam Hole: This is the limiting aperture of the CTW Beam line. It presents the limiting aperture for viewing the cold source.

Shutter in and out: The shutter is a 700 mm thick disk that rotates about a horizontal axis, which is parallel to but displaced from the MACS incident beam line. When the active part of the shutter is rotated a closed or one of three open positions becomes aligned with the CTW beam tube. The open positions can have different inserts that define different incident beam apertures. The largest beam aperture admits the full beam that can illuminate the full MACS monochromator.

Cryo Filter Exchanger (CFX): This is a closed cycle refrigerating unit that cools three neutron filters to less than 77 K. The filters primarily scatter fast neutrons away from the beam path to reduce background in the spectroscopic detectors. However, they also help to suppress order contamination. The filter options are 100 mm Be for $E < 5$ meV, 100 mm PG for $5 \text{ meV} < E < 15$ meV and 150 mm sapphire (tentative) for $15 \text{ meV} < E < 20$ meV. The filters are displaced along the beam line and move vertically in and out of the beam. Thus more than one filter can be lowered into the beam at a time. For safety reasons at least one of the filters must be in the beam at all times.

In Line Collimator Exchanger (ICX): This device has two radial collimators in succession. Each collimator can be lowered into the beam or raised above it thus offering four collimation options. Conceptually the radial collimators define an active area of the source from which neutrons can illuminate the monochromator. The collimators thus function as a virtual horizontal slit at the source. The ICX controls the energy resolution of MACS.

Variable Beam Aperture: This device trims the beam that is incident on the monochromator to a specified rectangular cross section. The device thus controls the overall envelope of the beam and hence the wave vector resolution.

Monochromator: The MACS monochromator is based on curved vertical strips of aluminum covered with PG crystals. The monochromator can be translated along the incident beam using a long ball screw so that the reflected beam passes through the center of the super-mirror guide drum. The range of travel is given in the table. The

monochromator stands on a horizontal translation stage that provides translation perpendicular to the reflecting surface. The translation stage stands on a rotation stage to choose the angle of incidence on the device.

Beam Dump Window: This is the end of the monochromator cask which holds a helium atmosphere around the moving monochromator. This location marks the transition to the separate get lost pipe, which is also helium filled but separate to facilitate assembly and because there are more limited alignment requirements on the get lost pipe than on the monochromator cask.

Beam Dump: This is the location of the front face of the white beam dump.

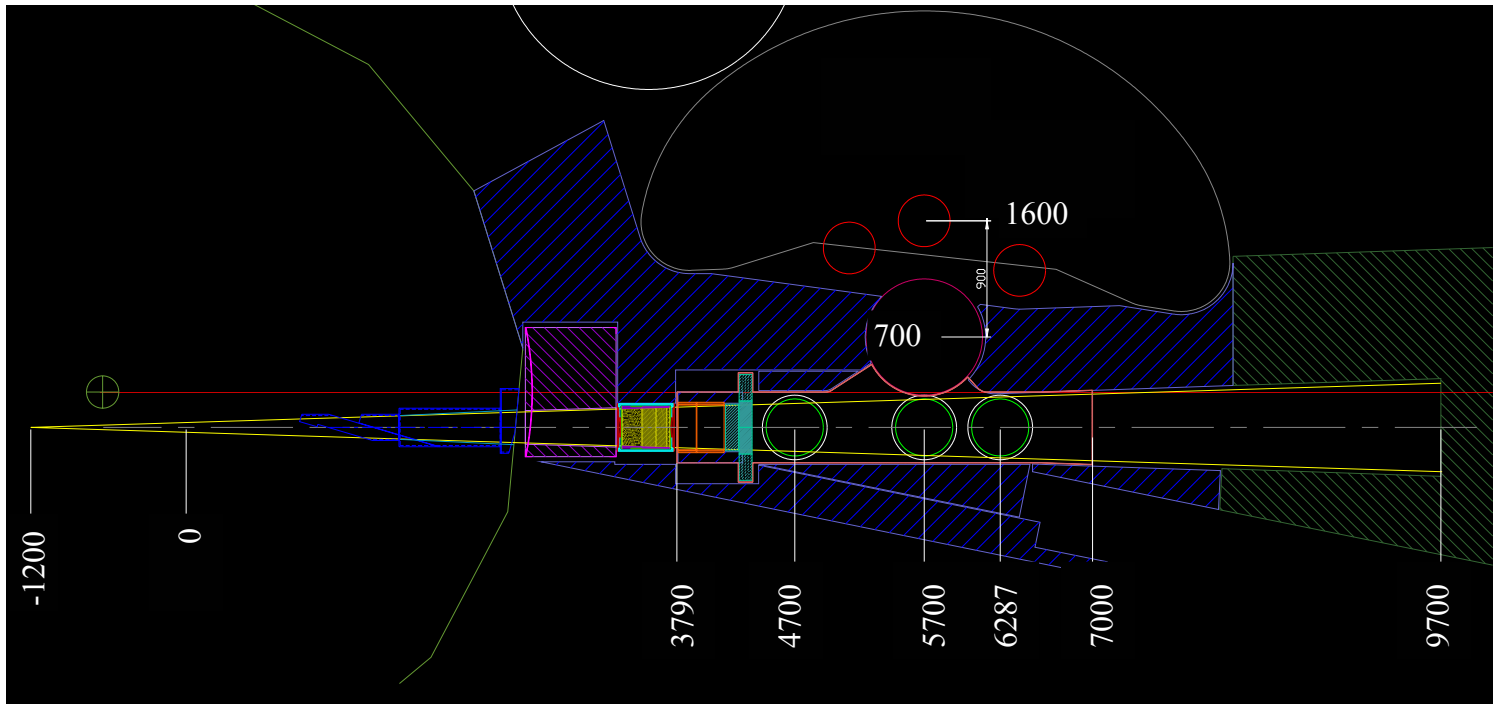


Figure 1. Overview of the MACS incident beam line showing the locations of beam line elements along the beam path. This is the MACS-5700 layout that was reviewed by NCNR in July 2003. The layout will be revised to increase clearance to BT7 and between the monochromator and super-mirror guide drum.